

## ABSTRACT OF THE DISCLOSURE

A particle separation device for removing particles from a fluid. An embodiment of the device includes a particle separation chamber with an annular tunnel. A plurality of inlet vanes extend within the annular tunnel for  
5 imparting a helical fluid flow by deflecting the fluid at an discharge angle. The vanes are shaped so that a deflection angle of the fluid moving along a surface of the inlet vanes varies smoothly from an initial axial direction as the fluid enters the vanes to the discharge angle as the fluid exits the vanes. A particle separation system includes a plurality of particle separation modules arranged  
10 in an array. A multi-annular particle separation apparatus includes a plurality of concentric particle separation devices.